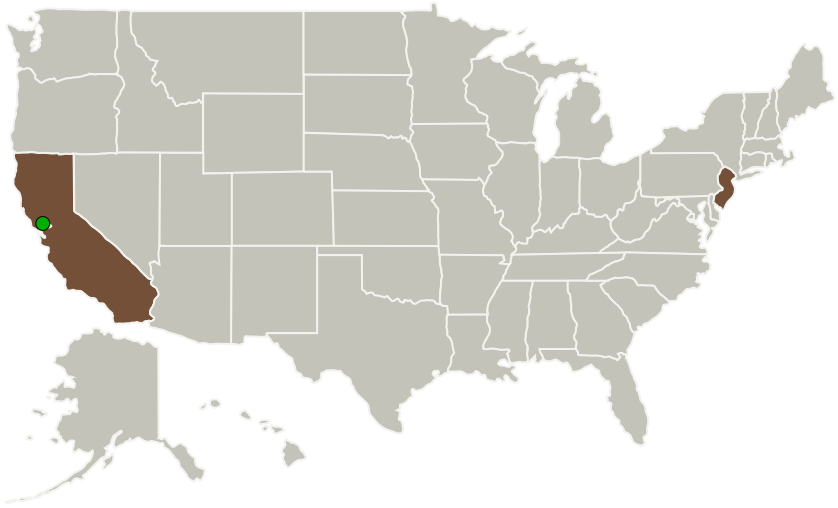
High-Order Aeromechanics Model Support for Rotorcraft Conceptual Design, Phase I

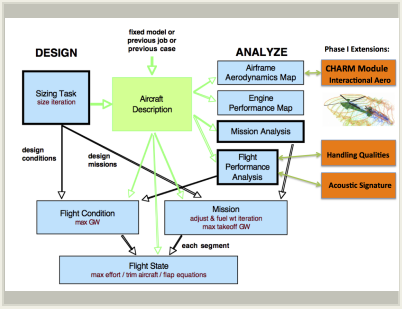
Completed Technology Project (2013 - 2013)

Project Introduction

Conceptual design tools for rotorcraft are used to size vehicles for intended flight operations, as well as reveal trends on the relative benefits certain configuration choices have on the resulting aircraft performance. This information is useful for indicating potentially valuable areas for further technology development that would enhance rotorcraft capabilities. These tools must therefore contain models of subcomponents that are sufficiently accurate to capture current rotorcraft technology performance metrics, but with suitably simplified models to permit rapid re-calculation as befits an optimization scheme. If subcomponent models are insufficient or lacking, they may be built up using simplified models or empirical relations derived from more detailed, comprehensive codes. This approach permits the rapid analysis turn-around required of a sizing program while still capturing the trending information available from the more detailed analysis tool. In the proposed Phase I program, CDI plans to use its full-span free wake analysis tool, the CHARM Module, to investigate approaches for adding this analysis capability to rotorcraft conceptual design software, specifically to extend options for aerodynamic performance modeling, computation of handling qualities metrics, and assessment of acoustic emissions. NASA has recently made available a sizing code named NDARC (for NASA Design and Analysis of Rotorcraft), which has a modular framework to permit the inclusion of different or additional subcomponent models in its operation as proposed here for development. Phase I will investigate the addition of these features in that conceptual design code as a convenient demonstration of the viability of this approach.

Primary U.S. Work Locations and Key Partners





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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Continuum Dynamics, Inc.	Lead Organization	Industry	Ewing, New Jersey
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	New Jersey

Project Transitions

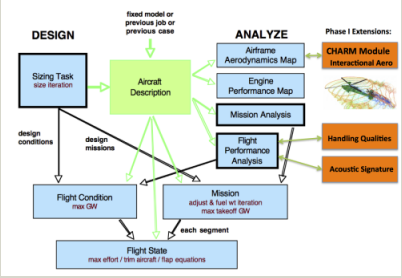
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138504)*

Images



Project Image
High-Order Aeromechanics Model Support for Rotorcraft Conceptual Design
(https://techport.nasa.gov/image/127428)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Continuum Dynamics, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

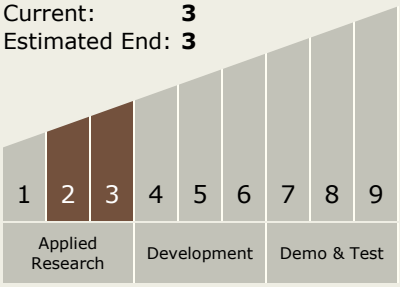
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Robert Mckillip

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.2 Flight Mechanics
    - TX15.2.4 Modeling and Simulation for Flight

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System